

Medical Control Guideline: MECHANICAL CIRCULATORY SUPPORT DEVICES

PRINCIPLES:

1. A Mechanical Circulatory Support (MCS) device is an implanted device that is used to partially or completely replace the function of a failing heart in adults and children. MCS devices may be used as a bridge to transplant or as destination therapy for those who are not transplant candidates.
2. There are several types of MCS devices. A ventricular assist device (VAD) can support the function of the left ventricle with a left ventricular assist device (LVAD), the right ventricle (RVAD), or both ventricles (biventricular device). A total artificial heart (TAH) replaces the heart itself. The most common device is currently a LVAD.
3. MCS patients have a coordinator available 24 hours a day who will provide direction on managing the device. Contact information for the device coordinator may be located on the device, refrigerator, medical-alert bracelet or on a card in the patient's wallet.
4. The patient and family members receive extensive training on their specific MCS device and should be utilized in the care of the patient.
5. Many MCS device patients are on anticoagulants and prone to bleeding.
6. MCS device patients are preload dependent and may be harmed by vasodilators (e.g., nitrates).
7. Most MCS device patient emergencies will NOT be related to malfunction of the device.

Ventricular Assist Devices (VAD)

8. Due to the continuous (non-pulsatile) flow of VAD devices, vital signs such as blood pressure, heart rate, and pulse oximetry are unobtainable or unreliable and perfusion status should be based on the clinical exam. Capnography will read accurately and can provide valuable information on the patient's perfusion status.
9. All VAD patients can be defibrillated and cardioverted, if indicated.
10. Chest compressions may dislodge the internal VAD tubes from the heart, causing the patient to bleed into the thoracic and/or abdominal cavities; however, chest compression can be performed if needed on VAD patients.

Total Artificial Heart (TAH)

11. The TAH produces pulsatile flow with a palpable pulse and measurable blood pressure.

12. TAH patients cannot be defibrillated or cardioverted and do not produce an ECG tracing.
13. Systolic hypertension increases afterload and may lead to pulmonary edema. In this situation, careful administration of vasodilators may be considered.
14. Chest compressions should not be performed on TAH patients because non-compressible mechanical chambers have replaced the ventricles.

GUIDELINES:

1. If there is concern for device malfunction, call the MCS device coordinator directly to assist with troubleshooting.
2. If the MCS coordinator is not reachable and/or additional orders are required, contact the Base hospital.
3. Treat MCS patients by the appropriate treatment protocol, based on your provider impression.
4. Attempt to locate an Advanced Healthcare Directive and/or a Standardized Patient-Designated Directives [e.g., Physician Orders for Life-sustaining Therapy (POLST), State DNR Form]. Most MCS device patients have made end-of-life care decisions.
5. Given that MCS devices are preload dependent, administer fluids early when directed by the Treatment Protocol.
6. All of the patient's MCS device equipment must accompany them to the hospital. Make sure all equipment is safely secured prior to transport to ensure that the driveline is not pulled or cut during transport. Spinal motion restriction and/or splinting may be modified to protect the integrity of the MCS device equipment.
7. When a MCS patient is experiencing signs and symptoms related to the device, every effort should be made to transport the patient to their MCS hospital. Allow the family member or caregiver to ride with the patient if treatment and space permit.

Ventricular Assist Devices (VAD)

8. Do not administer nitroglycerin; give only aspirin and morphine or fentanyl when treating patients with provider impressions Chest Pain - Suspected Cardiac or Chest Pain - STEMI.
9. Utilize clinical parameters for patient assessment (e.g., skin color, capillary refill, level of consciousness and general appearance), because these patients will not have a blood pressure and/or palpable pulse.
10. The patient's underlying rhythm only requires treatment if the patient has signs of poor perfusion. If external defibrillation or cardioversion is necessary, apply the pads as to avoid an internal Pacemaker/Implanted Cardioverter Defibrillator (ICD) and use the standard amount of energy. DO NOT disconnect the system controller from the percutaneous lead (driveline) or stop the pump prior to delivering the shock.

11. For patients in cardiac arrest, assess for VAD malfunction in consultation with the device coordinator. Chest compressions should only be initiated if the VAD is functioning and the patient remains in cardiac arrest or if the VAD cannot be fixed and resuscitation is in agreement with the patient's Advanced Health Care Directive or Standardized Patient-Designated Directives (e.g., POLST, State DNR Form).
12. In an unconscious, pulseless patient with a VAD, a capnography reading of < 20 is an indicator of poor systemic perfusion and should prompt initiation of chest compressions.

Total Artificial Heart (TAH)

13. Do not administer epinephrine. The resulting increase in afterload may cause pulmonary edema and circulatory collapse.
14. For patients in respiratory distress with a systolic blood pressure >150mmHg, administration of nitroglycerin should be considered. Alternatively, the patient may be assisted in self-administration of their home dose of oral hydralazine.
15. For patients in cardiac arrest, assess for TAH malfunction in consultation with the device coordinator. Do not perform chest compressions or attempt defibrillation. The only therapeutic option is to restore the function of the device.